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THE EFFECT OF PRODUCTIVITY ON VARIOUS STYLES OF WORKER-SUPERVISION.

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THE EFFECTS OF SEVERAL STYLES OF SUPERVISION UPON THE PERFORMANCE OF INDIVIDUALS WERE EXPLORED IN A LABORATORY SETTING IN WHICH SELECTED ASPECTS OF SUPERVISION WERE EXPERIMENTALLY MANIPULATED. PARALLELING THE WORK SITUATION, THE EXPERIMENTAL SETTING INVOLVED A CHOICE OF TWO ACTIVITIES, EACH OF WHICH WAS REINFORCED. THE ROLE OF SUPERVISION WAS TO MAINTAIN PERFORMANCE IN TASK "A," THE LESS ATTRACTIVE TASK. THE TWO-TASK SETTING PERMITTED CONTROL OVER IMPORTANT FEATURES OF WORKER SUPERVISION. THE EFFECTS OF PENALTY MAGNITUDES WERE EXPLORED UNDER BOTH FIXED AND VARIABLE INTERVAL SCHEDULES OF SUPERVISION. THE DATA LED TO THE CONCLUSION THAT A CONSIDERABLE DEGREE OF CONTROL CAN BE OBTAINED OVER IMPORTANT ASPECTS OF THE WORK SETTING. THE FINDING THAT THE PUNISHMENT OF PERFORMANCE ON ONE TASK LED TO GREATER PERFORMANCE ON A SECOND TASK WAS AT VARIANCE WITH PREVIOUS RESEARCH. (GD)

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THE EFFECT ON PRODUCTIVITY OF VARIOUS STYLES OF WORKER-SUPERVISION

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I. BACKGROUND

Problem

Throughout life people spend a good deal of time trying to get others to behave in ways they desire. Consequently, an important pursuit in social science has been the attempt to determine what kinds of efforts are most likely to lead to success. Obvious differences exist in people's ability to control the behavior of others. Quite obviously too, these differences are not random but appear to depend importantly upon the techniques of control which are used. For example, the ability to reward, to punish, to reason, or to impress are often pivotal skills necessary to successfully gain compliance in interaction. In everyday life, though, such skills are not always equally useful. Rather, the usefulness of most techniques varies by situation. For example, the praise and awards that are frequently used to motivate students to learn prove ineffective if they alone are used to motivate factory workers to produce. Similarly, while close supervision and frequent instruction may assist children in the rapid performance of a task, these same techniques may have the opposite effect for highly skilled adults. Because numerous techniques of control are possible in most situations, it becomes important to know the most effective ones. From the variety of situations in which control is exercised, this study focuses on the techniques used in one kind of setting -- one which involves supervision.

Relationships involving the supervision of one person by another form one of the primary bases of social control in organizations -- the means that ensure that persons within the organization will act in the desired manner. The rules of the organization generally specify

closely several features of the supervisory relationships. These include the different behaviors that may be supervised and the various means of control which may be used. Differences regarding these characteristics distinguish supervisory relationships in different organizations. Compare, for example, the relationship between a teacher and student in a university and a sergeant and private in the army. The teacher's supervision of a student's performance is limited to that which occurs in school. In trying to ensure a passing academic performance, the teacher may threaten a student with poor grades or praise him when he does well, but he cannot threaten him with physical injury or offer him monetary rewards. The sergeant, by comparison, may exercise control over the eating and sleeping habits of his men as well as their daily routines. His means of control range from imprisonment for disobedience to leaves for superior performance.

Although the supervisory relationship generally has some restrictions, considerable variation is possible within the limits imposed. With the controls which are permitted, the supervisor usually has considerable latitude regarding which of the controls he will employ and the manner in which they will be used. For example, he may use all the means at his disposal or any combination of them. He may use them frequently or only occasionally. The selection of means that a supervisor employs and the schedules with which they are used define what is known as his style of supervision.

Studies of supervision have been most frequently concerned with the effects of the presence or absence of various supervisory activities in a work setting. The effects of other components of supervision

style including the frequency or regularity of the activities or the magnitude of the sanctions imposed have been little investigated. The research has focused on the determinants of the productivity of work groups rather than individuals.

The study of types of supervisory activities in a group setting has been dictated in part by the field research techniques that have generally been used. While such methods may suggest practices which have a measurable effect on productivity, they have not led to the description of the parameters that determine the effectiveness of these practices. In general, field methods do not permit the experimental control and measurement necessary to determine the magnitude or duration of the positive or negative effects which a single aspect of supervision may have on productivity. These aspects are of considerable importance, however, in a systematic evaluation of the effectiveness of supervisory techniques. An experimental setting provides an opportunity for greater control over several of these dimensions.

In addition, specification of the effects of supervision is made more difficult by the focus on groups rather than individuals. The study of group reactions to supervisory practices fails to specify the contribution of unmeasured social events which may mediate the effects of supervision in a group. While the study of group phenomena is an important concern in its own right, a demonstration of uniquely group reactions in response to common events will require first a description of individual reactions to these events without the group.

The focus on the supervision of the individual is also suggested on pragmatic grounds. As Dubin has recently noted, the trend in modern industry increasingly emphasizes individual jobs as well as group or team work.

> An important corrective to current emphasis on the "groupness" of industrial work is to realize that there are now and will probably be an increasing proportion of all jobs which will not be performed in groups but will be performed individually and outside of group contexts. For individual jobs, the group theory of motivation simply will not apply and new studies will be necessary to find out how the lone worker can be moved to a high level of productivity and sustained there as a member of a modern work organization. This area is one of present ignorance among industrial psychologists and sociologists as well as among management practitioners.[1]

A similar trend is occurring in education where the development of automated techniques to present materials to be learned has led to an increased emphasis on methods of self-instruction.

For these theoretical and methodological reasons, the study explored the effects of several styles of supervision upon the performance of individuals rather than groups. A laboratory setting was developed in which important aspects of supervision can be experimentally manipulated.

Related Literature

Previous studies of productivity in both organizational and laboratory settings have shown that supervision style has an important effect on task performance. Aspects of supervision observed to be important include the degree of closeness[2] and punitiveness,[3] participation of the worker in task decisions,[4] and style consistency.[5] Studies within a number of blue and white collar work groups suggest that supervisors of the more productive workers tend to minimize the number of task instructions, to avoid the use of punitive measures in control, to permit participation in task decisions, and to supervise in a consistent manner when faced with similar situations.

Two of these variables, the closeness and punitiveness of super-

vision style, have been experimentally manipulated among work groups in a laboratory setting by Day and Hamblin.[6] Productivity was lowest among groups experiencing supervision which was both close and punitive.

Although previous studies have investigated a number of significant aspects of supervision, important ones remain to be studied. Thus, little attention has been paid either to the frequency of various practices or the magnitude of the supervisory acts (e.g. the severity of any particular punitive act). For example, the appearance of the supervisor may be frequent or occasional, regular or irregular. The penalties administered may be mild or severe. In addition, while punitive supervision has been investigated, little attention has been paid to its converse, the use of reinforcers such as rewards or encouragement, although these appear to be frequent features of supervision style. While these aspects are very difficult to measure in a field setting, the laboratory provides adequate control for their exploration. The experimental setting to be described has been developed to permit the control and measurement of some of these aspects of supervision. The time limits of this investigation permitted the exploratory study of only several of the possible variations. The effects of various magnitudes of punitive supervision were studied under several supervision schedules.*

II. PROCEDURE

The investigation involved the intensive study of a small number of subjects under various experimentally introduced conditions. The

*Initially the effects of reinforcing supervision were to be explored. However, time did not permit their study.

investigation of subjects over a period of time permitted the important study of the stability and the reversibility of the effects of the experimental changes. Such a procedure has been heretofore infrequently used in social psychology but is the preferred one in the experimental sciences. It is superior to the statistical comparison of experimental and control groups in demonstrating the causal importance of the changes introduced.

The experimental setting has been designed to maximize control over several important features of the work situation. However, before these features are described, it is important first to discuss the rationale behind their selection. The situation faced by a worker in a task setting has been conceptualized in the following manner. First, the assumption is made that the worker will perform those activities that receive the most reinforcement. In the natural task setting, of course, the worker's performance of his job receives considerable reinforcement. If the worker is successful, he receives not only money and promotions, but also the praise and esteem of management. However, in any work setting activities other than work are also reinforced. Frequently events such as taking a break, reading a magazine, or talking to friends may involve quitting the task for varying periods of time. The job of management in maximizing production is, of course, to minimize these periods. As one means of doing this, a supervisor may be instructed to periodically check-up on the workers. For check-ups to be effective, though, they must have consequences. Thus, the worker may be punished when he takes unauthorized breaks (e.g. fined, demoted, fired) or reinforced (e.g. given bonuses, promoted) for working hard.

In summary, the worker is frequently reinforced for several activities, only one of which is the task itself. The role of the supervisor is to maximize the amount of task activity by the use of various reinforcers and punishments. This analysis of the work setting focuses only on the control function of supervision. While in many settings supervisors perform other activities such as job planning or task instruction, they will not be considered in the present analysis.

Paralleling the work situation, the experimental setting involved a choice of two activities each of which was reinforced. To permit the precise measurement of the frequency with which each activity was performed, both activities were button pressing tasks. For each task, reinforcement depended upon the number of times a subject pressed a large, medium-effort button mounted on a small instrument panel. The reinforcer was money. A counter mounted on the panel indicated how much money the worker had earned. This type of task has the particular advantage of permitting the simple manipulation of its attractiveness. By varying the number of presses before a count was registered, the amount of money a worker could earn was controlled. To equalize the amount of money subjects could make on a task, a three second time out occurred after each response. The tasks were located at opposite ends of a small work room. Task performance was electronically recorded in an adjacent room.

The ratio of button presses to reinforcement differed for the two tasks. The ratio on Task A was higher than that on Task B. Thus of the two Task B was presumably the more attractive (more money could be earned on it).[7] The role of supervision, however, was to maintain performance on Task A, the <u>less</u> attractive task. Supervision was indicated by a brief sounding of a buzzer in the work room. The subject then received one of several consequences depending upon the task

at which he was working and the style of supervision that was used. The use of various consequences to eliminate behavior on the higher paying task while increasing it on the lower paying one was hypothesized to be analagous to the supervisor's use of various means to eliminate unauthorized behavior while increasing job productivity in a non-experimental setting.

This two-task setting permits control over important features of worker supervision. Most basic, assuming that task behavior in the absence of supervision is controlled by the monetary attractiveness of the two tasks (a testable assumption), behavior changes in the presence of supervision may be attributed to some aspect of the supervisory consequences. In addition, the setting permits variations in important aspects of supervision style. Manipulatable elements include: a) Type of supervisory consequence. Punitive or reinforcing styles of supervision are readily operationalized. Supervision can be followed by monetary fines (punishment) if the subject is responding on Task B (the higher paying task) or by monetary bonuses (reinforcement) if the subject is responding on Task A. Other non-monitary consequences including breaks, praise, desirable activities, etc., can be programmed as well. b) Magnitude of supervisory consequence. Penalties or bonuses of various magnitudes can be used. c) Means of delivering supervisory consequences. In the setting described supervision was indicated by a buzzer without being accompanied by the appearance of a supervisor. The effects of the personal administration of consequences can be measured by having the supervisor himself appear. d) Schedules of supervision. The intervals between each supervision

can be long or short, fixed or varied. Interval length is an important aspect of close supervision. Other situational aspects including task attractiveness and social interaction are also amenable to manipulation.

The two task work setting was designed to eliminate problems which arose with an alternative type of work situation. In an earlier experiment, subjects were paid to perform a single task. Subjects pressed three buttons in a sequence indicated by illuminated lights. Subjects were paid an hourly rate. Various supervisory conditions were to be introduced to increase work rate. It was found, however, that for most subjects little if any increase was possible. While it was predicted that on a repetitive, dull task, work rate would be moderate, in fact after six one and two hour sessions, work rate continued near the task maximum. The high rate was attributed both to the absence of alternative sources of reinforcement in the work situation and the motivation to do well in an experimental setting. Thus the two task situation was designed to produce variance in task choice.

Initial research has explored the effects of punitive supervision on task performance. The subject performing Task B at the time of supervision (sound of the buzzer) was penalized. The penalty count was registered on a separate counter in the workroom; the amount of the penalty was indicated next to the counter. No penalty occurred if Task A was being performed. A 2:1 ratio in the amount which could be earned on Tasks B and A was used. Thus, with a 6:1 ratio of button presses to reinforcement on Task B and a 12:1 ratio on Task A, subjects could earn approximately $2.00 and $1.00 per hour respectively on the two tasks since three seconds had to elapse between each registered press. With a 4:1 ratio on Task B and an 8:1 ratio on Task A,

subjects could earn $3.00 and $1.50 respectively. A light on each task indicated the duration of the time out. Only one of the two tasks was operable at a time. A subject-controlled switch on Task A determined which task could be run. Penalties were administered if Task B was switched on at the time of supervision. Since the change-over from work on Task B to Task A resulted in a several second delay while the subject crossed the room and turned on Task B, frequent switching to avoid penalties resulted in reduced task reinforcement.[8] A clock on the wall was visible at all times.

All events and measures were programmed and recorded by automated equipment in an adjacent room. Response rate and task choice were recorded on a cumulative recorder.

Subjects were told only how to operate the tasks and that the sound of a buzzer would be followed by a loss of money if they were working on Task B. The two tasks were <u>not</u> presented to the subjects as preferred or unpreferred by the experimenter. The subjects were college students who were informed before volunteering that they would have an opportunity to make money on a laboratory task.

The effects of penalty magnitudes were explored under both fixed and variable interval schedules of supervision. Schedule type proved to be an important parameter in determining the penalty's effect. Different subjects were used for each of the schedules. Within a schedule, however, subjects were exposed to several different penalty magnitudes. Changes in penalty were made only after subjects evidenced inter-session stability in task work under a given condition. The subjects worked 1-4 hour sessions several times a week. Payment was made at the conclusion of the total hours of work.

III. RESULTS

Fixed Interval Schedules

Seven subjects worked over periods ranging from 4 - 14 hours on several fixed interval schedules in which supervision came at equal intervals throughout a work session. The different schedules included intervals of 1,3,5 or 10 minutes. Penalties from $.02 to $2.00 were used. The reinforcement ratios on Tasks A and B were 12:1 and 6:1 respectively. Under the fixed interval schedules a similar pattern developed for all subjects - a pattern, however, which did not vary appreciably as a function of either interval length or penalty magnitude. On all schedules subjects generally reached a steady state of task performance by the end of the first hour of work. Figure 1 indicates the first hour's performance of a typical subject on an FI 3 minute schedule.

Early in the hour the subject spent considerable time on Task A. As the hour progressed, however, the time spent on Task A both before and after supervision decreased markedly. By the end of the hour the subject switched to Task B immediately after the supervision and remained there until approximately 30 seconds before the next supervision. This terminal pattern continued through succeeding hours and was not sensitive to changes in penalty magnitude. The measure of effect was the proportion of time subjects spent on Task B under the various penalty conditions. Response rate was not found to vary on the two tasks although subjects had different average response rates.

Figure 2 indicates the percentage of time spent by five subjects on Task B working on an FI 3 minute schedule under various penalty

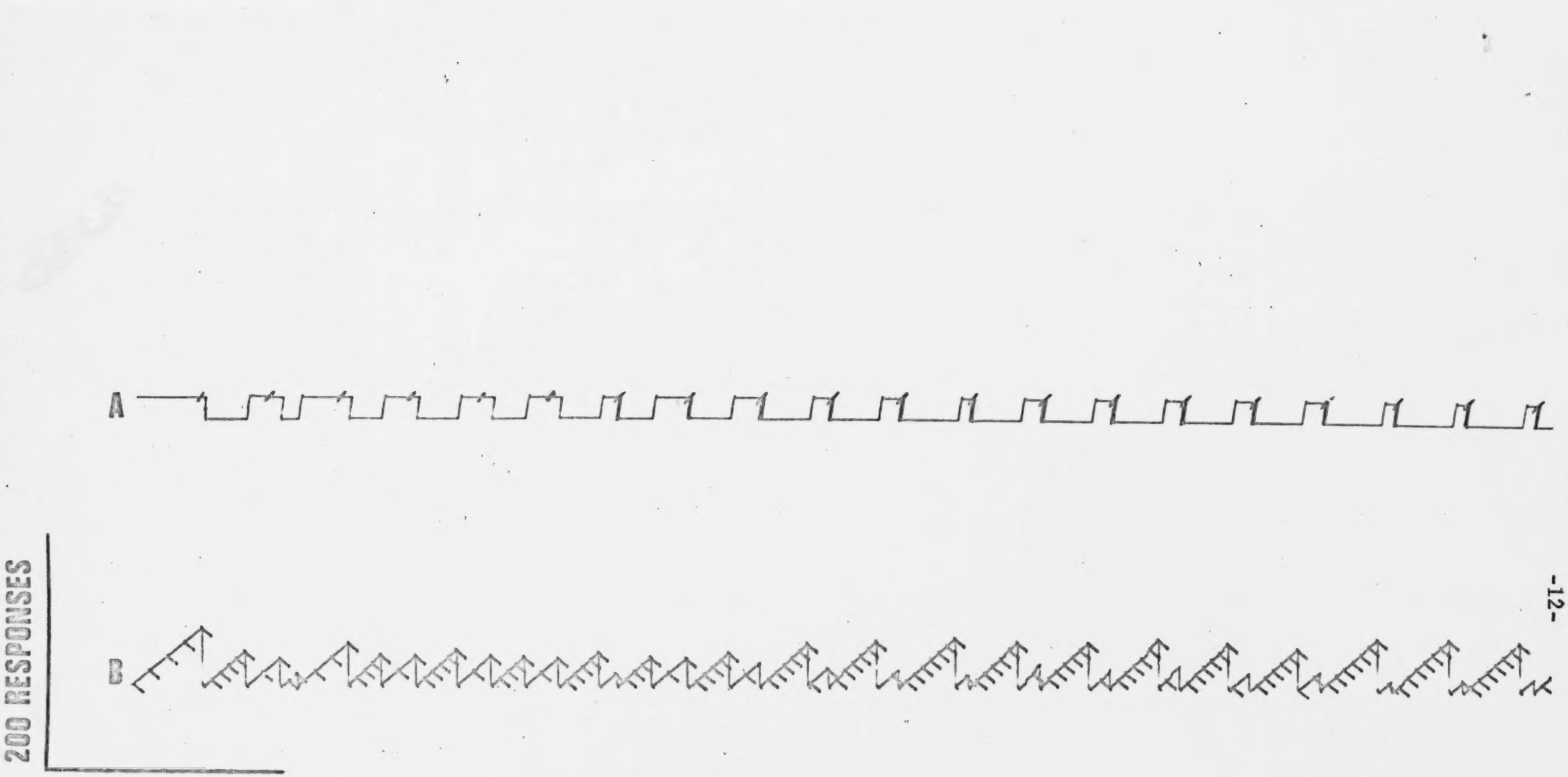

Fig. 1. Cumulative record of Subject CC on FI (3) - $.08 penalty during first hour of work. Record A indicates the time spent on Tasks A and B. The pen was deflected downward when Task B was operated. Hatchmarks indicated supervision. The response rate is indicated by record B. Pips indicated reinforcement. The pen reset each time the subject changed tasks.

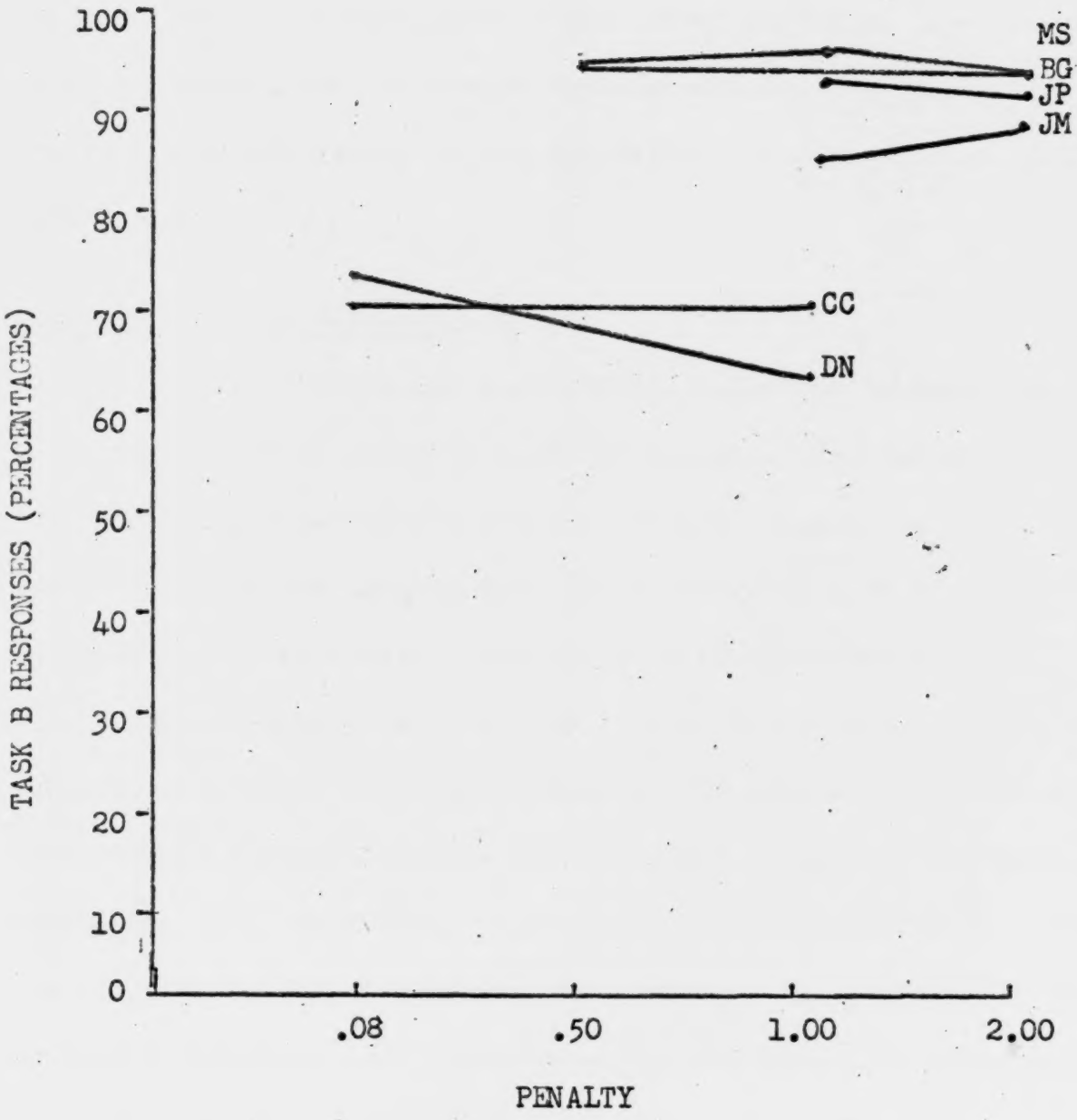

Fig. 2. Percent Task B responses under the various penalty conditions for FI(3) subjects.

conditions. Penalty changes were not systematically related to the proportion of work on Task B.

Adjustments to changes in interval length were also made very rapidly. Since subjects spent a very short period of time on Task A prior to supervision, increases or decreases in interval length has only a slight effect on the proportion of time spent on Task B during an hour.

Variable Interval Schedules

Two types of schedules with varying intervals between supervisions were used. Initial research used two variable interval schedules each employing a two minute minimum interval length. Five subjects worked over periods ranging from 20- 39 hours on a VI 4 minute supervision schedule with intervals equally distributed from 2 - 6 minutes; four subjects worked from 26 - 50 hours on a VI 7 minute schedule with intervals ranging from 2 - 12 minutes. In both schedules each subject worked alternate periods under a high and low penalty condition. The two minute minimum was used to reinforce some work by the subjects on Task B during a work period. The length of time spent on Task B following each supervision was the principal measure of the effects of penalty size and variable interval length (frequency of supervision). Both penalty size and interval length had consistent effects on Task B performance. For all subjects an increase in penalty size was followed by a decrease in time spent on Task B. Also, subjects who worked on the VI 7 schedule generally spent longer periods on Task B than subjects on the VI 4 schedule. However, the changes, while consistent, were generally quite small. The sizable proportion

of Task B work produced by the two unpenalized minutes following each supervision tended to mask the effects of the manipulated variables. Thus, additional subjects were placed on a variable interval schedule without a minimum interval and worked under a wider range of penalty conditions.

Four subjects worked over periods ranging from 24 - 37 hours on a variable interval schedule with an average of four minutes between each supervision. The intervals varied between ten seconds and eight minutes. Penalties from $.01 to $1.00 were used. The reinforcement ratios on Tasks A and B were 8:1 and 4:1 respectively. The measure of effect was the proportion of time during an hour that the subjects spent on Task B.

During the subject's first two hours of work no penalties were administered although the buzzer continued to sound on the VI schedule. In the following hours two progressions of penalties were used. Two subjects were begun on high penalties which were progressively decreased when inter-session stability was achieved. The other two subjects were begun on low penalties which were progressively increased. Several penalty magnitudes were repeated following intervening periods of work under other penalties to determine the replicability of their effects.

Figure 3 shows the proportion of time the subjects spent on Task B under the various penalty magnitudes. For all subjects the proportion of time spent on Task B declined with increasing penalty size. The relationship, however, is non-linear. Small penalties of less than $.03 had little effect on task behavior while moderate penalties from $.05 to $.15 considerably reduced the time spent on Task B. High penalties of $.25 or more generally elimated all time spent on Task B after several hours of work. No pronounced effects appear to be caused by penalty sequence. Figures 4 and 5 show the performances on one of

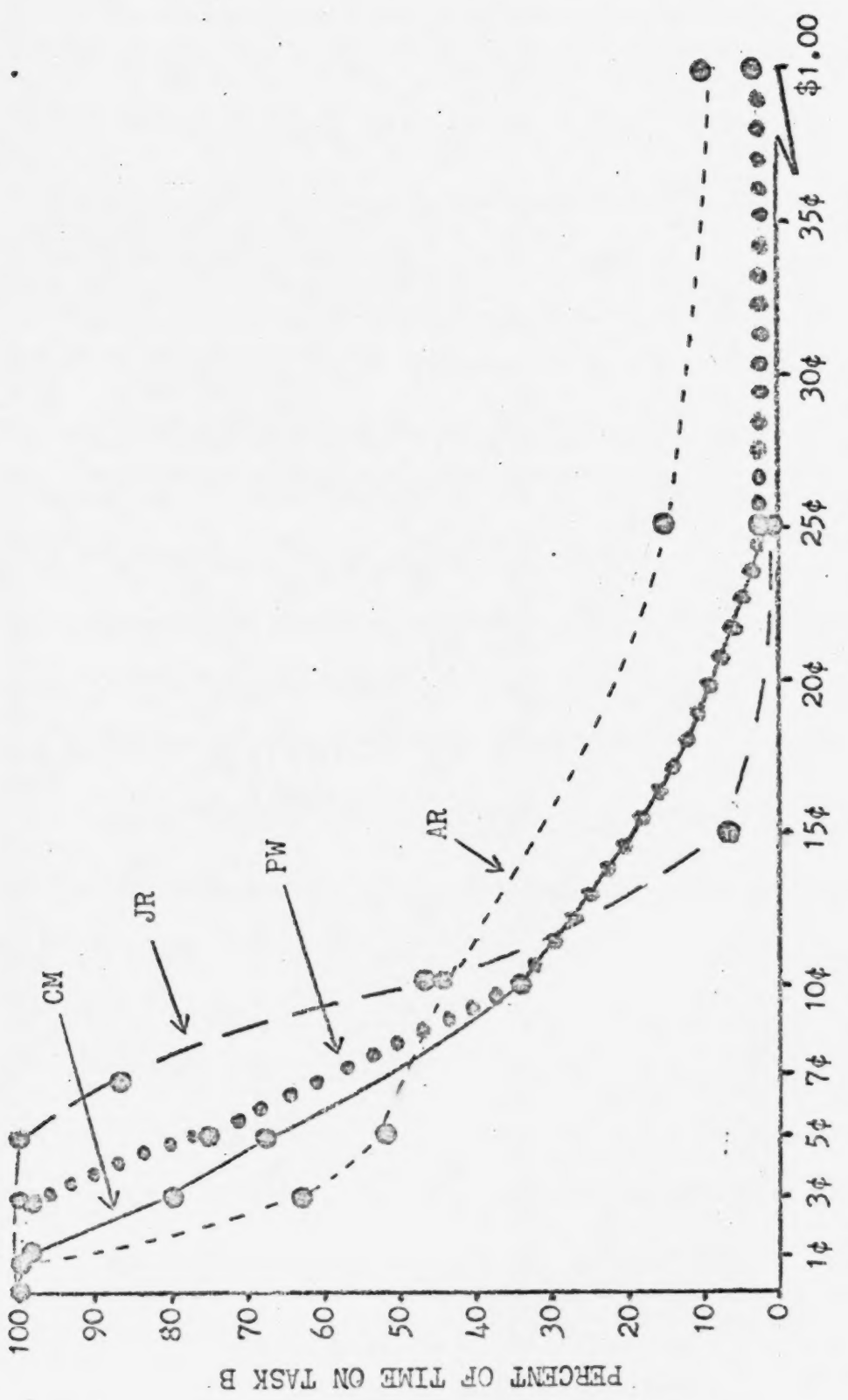

Fig. 3. Percent of time spent on Task B under various penalty conditions.

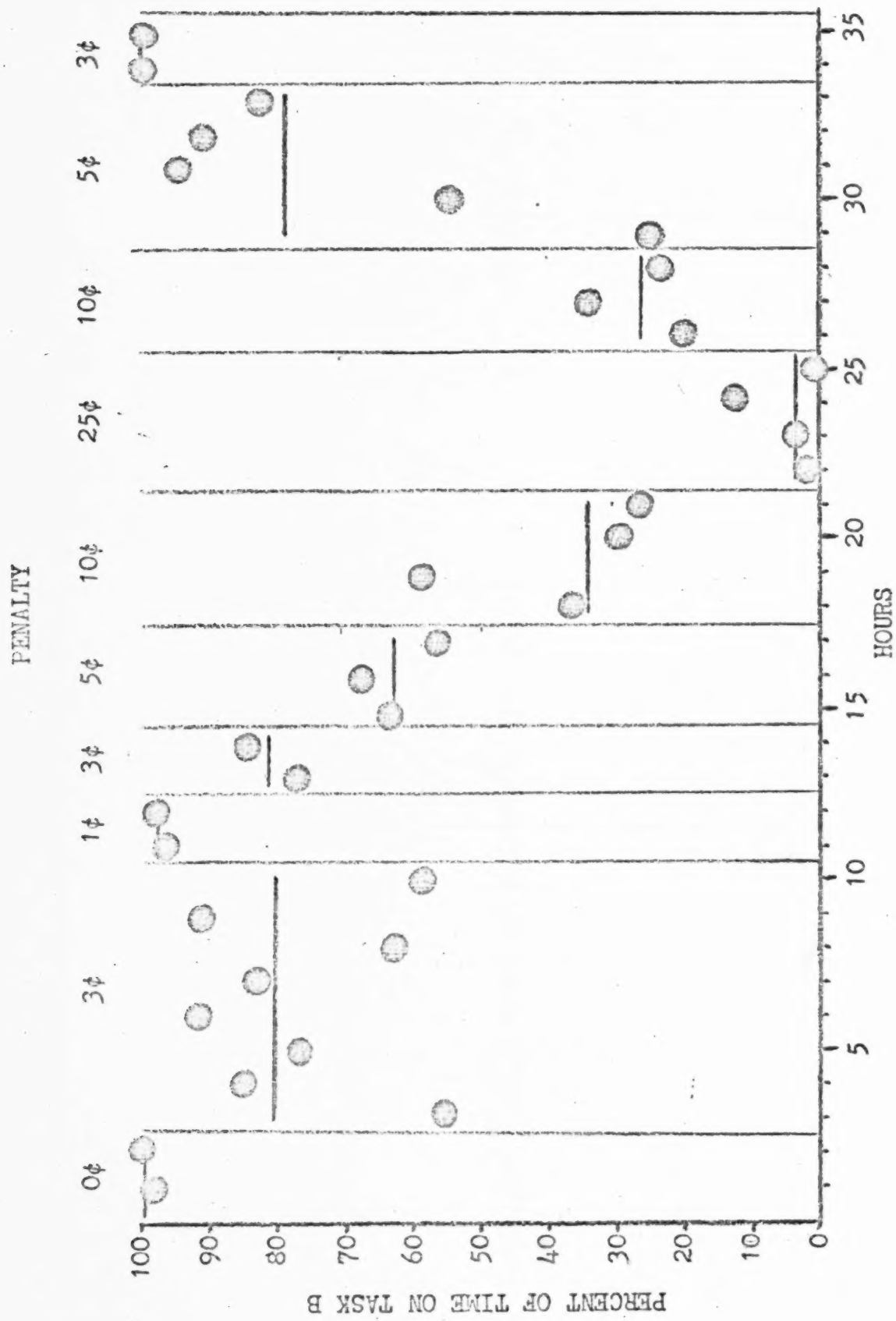

Fig. 4. Percent of time spent on Task B under various penalty conditions. (Subject CM)

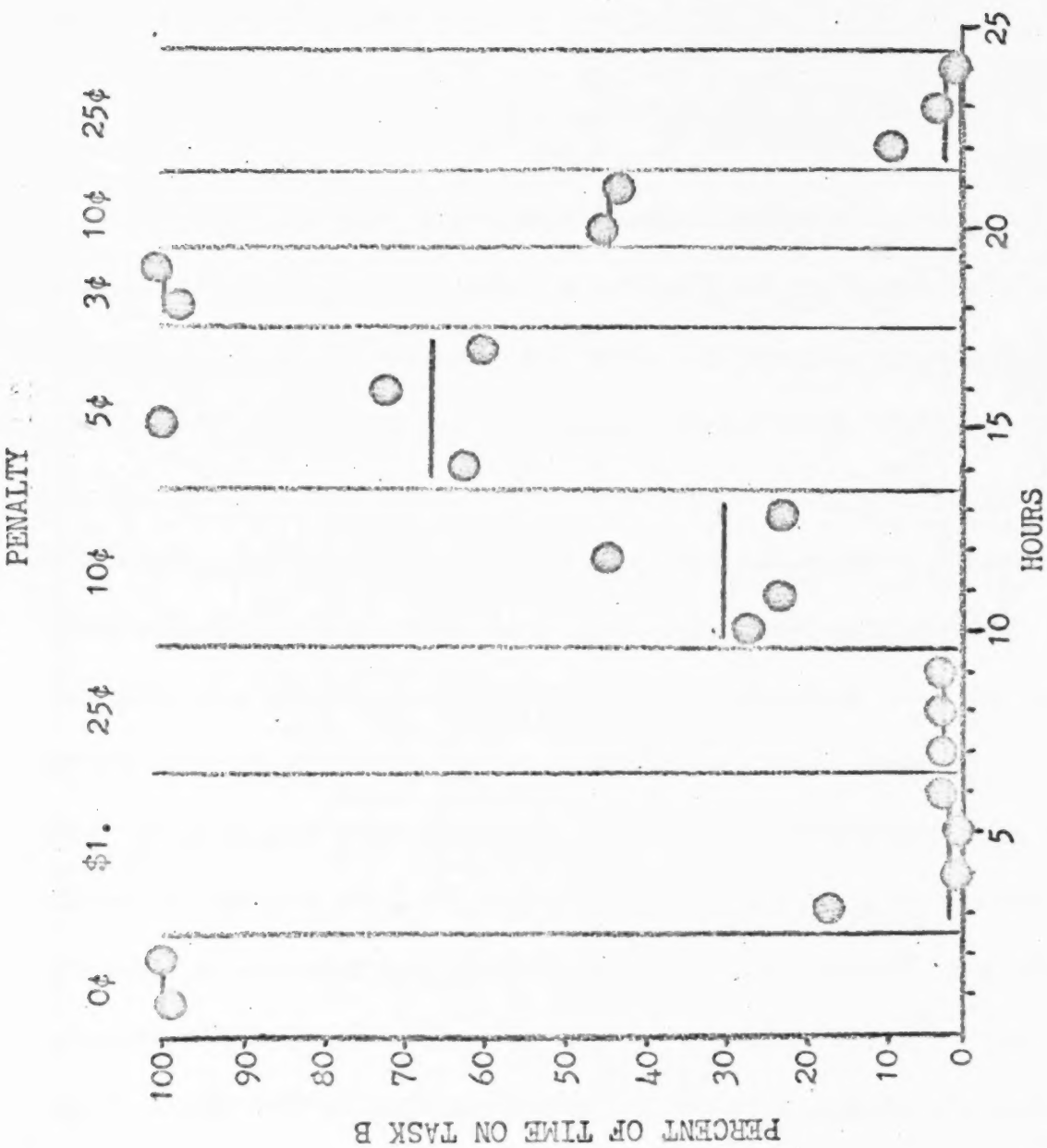

Fig.5. Percent of time spent on Task B under various penalty conditions. (Subject PW)

the subjects from each of the two penalty sequences. As the data indicate, task performance under the various penalty conditions showed considerable stability particularly under the penalty extremes. Similarly, replicability of the performances was greatest under the high and low penalties, although the performances under moderate penalties were not greatly discrepant.

IV. DISCUSSION

The data suggest the considerable degree of control which can be obtained over important aspects of the work setting. Only when supervision occurred at unequal intervals did penalty magnitude significantly affect the allocation of task time. Under this condition the penalties functioned as an effective punishment; behavior on the punished task was substantially reduced. However, the effects of punishment in the work setting appear to depend importantly not only on penalty magnitude, but upon the characteristics of the non-punished task as well. Previous research on punishment by Azrin and others indicates that the effectiveness of moderate punishment in reducing the frequency of a response depends upon the presence of an alternative means of reinforcement. Without an alternative, only very high magnitudes of punishment will permanently suppress behavior on the punished task.[9] Thus in the work setting the effectiveness of the moderate penalties would appear to depend upon the attractiveness of Task A. This dependence was demonstrated by a significant change in task behavior when the reinforcement on Task A was substantially reduced. For one subject the ratio of task responses to reinforcement was increased from 8:1 to 20:1 under a $.15 penalty. The proportion of time spent on Task B increased from 13% to 74%.

Significantly, the finding that the punishment of performance on one task leads to greater performance on a second is at variance with previous research on supervision style which suggests that punitive supervision is related to a decrease in productivity. In the experimental setting the use of punishment to reduce behavior on the higher paying task was hypothesized to be analagous to the supervisor's use of punitive measures such as threats or fines to eliminate unauthorized behavior in a job setting. While the conflicting results may be attributed to an incomplete experimental analog or to differences in the measures used, the results more strongly suggest that different parameters may be operating in the field situations that have been studied. A survey of previous research, for example, indicates a focus on work situations in which workers received a fixed rate of pay, i.e., salary or hourly pay. In the experimental setting, however, subjects performed on a piece rate; pay was directly contingent upon the amount of work performed. A further analysis of the work setting suggests how the type of payment might mediate the effects of supervision on productivity.

Where workers are paid at a fixed rate, continuing employment is generally contingent upon at least a minimum level of job performance. Beyond this level, however, a higher quantity or quality of work will be dependent upon other reinforcing variables in the work situation. For example, hard work may lead to supervisory praise, bonuses, or a recommendation for promotion. If the worker is adequately reinforced by events contingent upon harder work, he will work beyond the level for which he is paid.[10] However, if reinforcement for additional work either is never used or ceases, as may be the case if the supervisor uses

excessive punitive control to simply keep workers on the job, the worker may have nothing to gain for more than minimal job performance. In the former case work groups experiencing punitive supervision will be less productive than those receiving supervisory reinforcement. In the latter case, productivity within the group will decline as punitive supervision increases.

Consider, in comparison, piece rate work. Reinforcement is provided in proportion to the amount of work performed. Assuming that the piece rate is an effective reinforcer, productivity will vary with the amount of time spent on the job. If in the absence of supervision the worker would engage in some non-work activity, restriction of the worker to his job by punitive means may increase his productivity by increasing the amount of job time.[11] Thus the type of payment in the work setting may determine which of several effects punitive supervision has on task performance.

Contributing also to the discrepant findings might be the unmeasured natural effects of social behavior in the/work setting. For example, workers may respond to punitive supervision with social pressures to reduce productivity with the desired effect being dismissal of the supervisor.

Thus the isolation of several of the aspects of worker supervision suggests other parameters whose exploration may further clarify the effects of supervision on worker performance.

V. IMPLICATIONS

The findings suggest the importance of both supervision schedules and task characteristics in determining the effects of supervision in controlling work behavior. Of the various supervisory activities,

the element of control is probably the most ubiquitous function of worker supervision. In most settings at least one of the jobs of the supervisor is to maximize the worker's performance of a prescribed set of behaviors. In industry, these behaviors might include the performance of a production task or the adherence to a set of instructions; in education they might include the completion of a composition, a level of proficiency in mathematics, or cooperation with other students. In a large range of supervisory settings, the variables manipulated in the experimental situation are among the potential components of supervision style. Punitive supervision in its broadest definition includes not only fines, threats, or physical abuse, but also more subtle behaviors such as criticism, ridicule, slights, snubs or avoidance.

Recent changes in industry and education have led to an increasing number of settings in which a task is performed without the continual presence of other individuals and thus without the immediate effects of their social control. In both industry and education automation is primarily responsible for the altered work patterns. In education the development of automated teaching devices has increased the feasibility of methods of self-instruction or of instruction in small groups. With the promise that these techniques have shown, as well as the manpower shortage in education, such programs will increasingly become an integral part of education. The experimental dimensions explored may have particular application to these settings where social pressures may be minimal or absent.

The student in a learning situation is generally reinforced by a number of activities. In many cases some of these may be more rein-

forcing than work on the instructional materials themselves. Assuming that learning itself is reinforcing, the experimental findings suggest that intermittent check-ups with moderate punishment for unauthorized activities may considerably increase time spent on the material to be learned. If the material is not reinforcing, the results suggest that any additional reinforcement which is given be administered according to the amount of work performed rather than at a fixed rate.

A disadvantage in the use of punishment is the risk that the work situation itself may become aversive to the individual and that he will leave or avoid it when he is given the opportunity. The critical variable in preventing such an effect appears to be the availability of other significantly reinforcing activities. When these are present mild or moderate, punishment for any one activity will not make the situation itself aversive.

Recently there has been a focus on the instructional problems in teaching lower and working class students who do not have the traditional middle class experiences which schools have typically relied upon to reinforce learning. The development of effective instructional programs may require new techniques of control and different kinds of reinforcement. Generalizations from basic research of the type pursued in the present study may prove valuable in their construction.

FOOTNOTES

1. Robert Dubin, Leadership and Productivity, San Francisco: Chandler, 1965, p. 19.

2. See, for example, Daniel Katz, Nathan Maccoby, and Nancy C. Morse, Productivity, Supervision, and Morale in an Office Situation, Part I, Ann Arbor: Survey Research Center, University of Michigan, 1950; Daniel Katz, Nathan Maccoby, Gerald Gurin, and Lucretia G. Floor, Productivity, Supervision, and Morale among Railroad Workers, Ann Arbor: Survey Research Center, University of Michigan, 1951; Alvin W. Gouldner, Patterns of Industrial Bureaucracy, Glencoe, Illinois: Free Press, 1954; and Robert L. Kahn and Daniel Katz, "Leadership Practices in Relation to Productivity and Morale, " in Dorwin Cartwright and Alvin Zander (eds.), Group Dynamics, 2nd ed., Evanston, Illinois: Row, Peterson Co., 1960.

3. Michael Argyle, Godfrey Gardner, and Frank Ciofi, "Supervisory Methods Related to Productivity, Absenteeism and Labor Turnover," Human Relations, 11 (1958), pp. 23-40; and Robert C. Day and Robert L. Hamblin, "Some Effects of Close and Punitive Styles of Supervision," American Journal of Sociology, 69 (1964), pp. 499-510.

4. See, for example, Kurt Lewin, Ronald Lippitt, and Ralph White, "Patterns of Aggressive Behavior in Experimentally Created Social Climates," Journal of Social Psychology, 10 (1939) pp.271-299; Lester Coch and John R.P. French Jr., "Overcoming Resistance to Change," Human Relations, 1 (1948), pp. 512-532; and Victor H. Vroom, Some Personality Determinants of the Effects of Participation, Englewood Cliffs, New Jersey: Prentice-Hall, 1960.

5. Rensis Likert, New Patterns of Management, New York: McGraw-Hill, 1961, pp. 93-94. For recent summaries of much of the literature on supervision and productivity see Michael Argyle, Godfrey Gardner, and Frank Ciofi, "The Measurement of Supervisory Methods," Human Relations, 10 (1957), pp. 295-313; and Robert Dubin, Leadership and Productivity, San Francisco: Chandler, 1965, pp. 1-50.

6. Day and Hamblin, op.cit.

7. Technically described, the subjects had a choice of one of two tandem reinforcement schedules. The three second time out after each response produced a fixed interval schedule with three second intervals (FI 3 sec.). Reinforcement for each task was contingent upon the completion of a fixed number of FI components. The tasks themselves were concurrent operants.

8. Tasks A and B were thus tandem schedules of FR 4 (FI 3 sec.) and FR 8 (FR 3 sec.) respectively. The light served as an S^D for the completion of each FI component. See R. T. Kelleher, "Chaining and Conditioned Reinforcement," in Werner K. Honig (editor), Operant Behavior, New York: Appleton-Century-Crofts, 1966.

9. For a recent summary of the effects of punishment, see N.H. Azrin and W.C. Holz, "Punishment," in Werner K. Honig (editor), Operant Behavior, New York: Appleton-Century-Crofts, 1966.

10. In some work settings the worker may also be punished as a "rate buster" for harder work. In such a case the additional effort would be contingent upon the greater effectiveness of the reinforcement.

11. In some work situations the effectiveness of piece rate reinforcement may be tempered by the workers' belief that with high work rates management will raise the piece rate requirement and thus lower the rate of reinforcement. The present analysis assumes the absence of such a condition.